Topics that the student must prepare for their first midterm

For your first midterm you should be able to

1. find the domain of a given function

2. find the inverse of a given function

3. calculate limits of the form $\lim_{x\to a}$, $\lim_{x\to a^+}$, $\lim_{x\to a^-}$, $\lim_{x\to\infty}$, and $\lim_{x\to-\infty}$, and work with the indeterminate forms $\frac{0}{0}$, $\frac{\infty}{\infty}$, and $\infty - \infty$

4. find asymptotes

5. calculate the derivative of a function by using the definition of derivative

6. find tangent lines

7. solve parametric problems related to "limit" , "continuity" , or "derivative" ; an example of such questions is this:

   Find the value(s) of k such that the function

   $$f(x) = \begin{cases} \frac{\sqrt{1+kx}-1}{x} & x < 0 \\ (x-k)^2 + \frac{k}{2} - 1 & x > 0 \end{cases}$$

   has a limit at the point $x = 0$.

8. apply the differentiation rules (sum, subtraction, product, and quotient)

9. calculate higher order derivatives

10. apply the chain rule (for derivatives) and the extended power rule

11. work with left-hand limit, right-hand limit, left-hand derivative, and right-hand derivative